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Municipal sanitary sewer systems are, second to the drinking water system, the most important public health asset of a city. When they are properly operating, that is, carrying the wastewater and sewage away from homes and businesses and to the treatment plant, they protect the public from the potential health hazards associated with human waste. However, when blockages in the pipes cause backups into homes or businesses or overflows in streets or right-of-ways, the health of citizens is at risk. One of the factors that contributes to sewer line blockages is the intrusion of tree roots. Landowners and landscape professionals should be aware of the location of sewer lines when planning landscapes. If in doubt about the locations of sewer lines, drain field or connection pipes, contact your local public works department.

In an effort to reduce the amount of root intrusion into sanitary sewer lines, collection operators may recommend trees that are “sewer-safe.” The general recommendation is to choose small, slow-growing species, varieties or cultivars with less aggressive root systems and to replace them before they get too large for their planting area. There are no “sewer-safe” trees, but by using small, slower-growing trees, sewer lines should be safer from the intrusion of tree roots.

Tree roots invade sewer lines because the pipes contain three elements necessary for tree growth: water, nutrients and oxygen. Simply put, the roots grow into the pipes because they like it there. The degree of root invasion is dependent upon the condition of the sewer line, the type of tree and the soil conditions that exist in the root zone. Trees generally have as much biomass underground as they have above ground level. Because roots grow predominately in the top 18-24 inches of the soil, the horizontal spread of the roots can be great. The planting process may be adjusted to maintain an optimum root environment so tree roots stay within that optimum environment and as far from the pipe-lines as possible.

The rooting environment strongly affects root growth. Roots tend to proliferate where essential resources are concentrated (Coder, 1998). To discourage root invasion of the lines, create an environment for optimal tree root growth as far from the sewer line as possible. Trees should be planted in large pits. Dig up as large an area as possible to provide a good rooting environment. The soil in these pits should be loosened to provide good drainage and root growth. Add organic amendments as well as lime and fertilizer to create a root zone that is concentrated with “essential resources.” Obtain a soil test to determine the nutrient needs of your rooting environment.

Adverse soil conditions may be created near the pipes to discourage root growth in these areas. Root barriers are often used to protect curbs and sidewalks from root damage. In these cases vertical barriers direct roots downward, away from the surface infrastructure, although roots are persistent and can actually grow under and around barriers if water and nutrients are available. Root barriers could be placed above or around sewer pipes at installation. Otherwise, root



Photo Credit: Wayne Clatterbuck

**Trees should be located more than 10 feet from sewer lines to minimize root intrusion.**

barriers are expensive and difficult to install once the sewer lines are in place. Frequently, certain types of landscape fabric are used to protect drainpipes and leach lines from root intrusion, but this may not be practical in municipal sewer lines. Some products contain slow-release chemicals that prevent root growth. Other root barriers would include very compact layers of soil; chemical layers such as sulfur, sodium, zinc, borate, salt or herbicides; air gaps using large stones; and solid barriers like plastic, metal and wood. Each of these barriers can be effective in the short term, but long-term results are difficult to guarantee (Coder, 1998). Many of the chemical barriers, especially salts, can be absorbed by the tree. In excessive amounts, these can be harmful to tree health, causing the tree to decline or die.

Most of the literature on the issue of root intrusion into sewer lines recommends improving the integrity of the sewer lines. This is easy to say and expensive to accomplish. But as work is performed on the pipes, especially when making taps and installing service lines, quality, watertight construction is of premier importance. In certain areas, wrapping pipelines in a barrier fabric may be the best solution.

In spite of all we do in an attempt to avoid root intrusion, totally avoiding it may not be possible. Trees are tenacious survivors that will seek resources wherever and however they exist, even in adverse environments.

The accompanying table lists slow- and moderate-growing trees that may fit various urban needs. Some of these species are more shrubs than trees and some have liabilities that may preclude their use in particular areas. Ornamental trees frequently have fruit that becomes messy, thorns or unmanageable growth patterns. Species NOT recommended to plant near wastewater pipes would be the large, fast-growing, aggressive-rooted trees such as the *Fraxinus* (ash), *Liquidambar* (sweetgum), *Populus* (poplar and cottonwood), *Quercus* (oak, usually lowland varieties), *Robinia* (locust), *Salix* (willow), *Tilia* (basswood), *Liriodendron* (tuliptree) and *Platanus* (sycamore), as well as many *Acer* species (red, sugar, Norway and silver maples and box-elder). Generally, these trees are large when mature, with expansive root systems.

For managed landscapes near sewer lines, trees should be replaced every eight to 10 years before they grow too big. This would limit the distance that roots grow outside the planting area and the time they would have to grow into sewer line cracks, as well as foundations, sidewalks and other infrastructure.

### **Selected References:**

Coder, Kim D. 1998. **Root Growth Control: Managing Perceptions and Realities.** Landscape Below the Ground II. Proceedings of a Second International Workshop on Tree Root Development in Urban Soil. March 5, 1998. International Society of Arboriculture.

Fare, D.C. and W.K. Clatterbuck. 1999. **Trees to Plant in Containers or Wells.** Publication SP532, Agricultural Extension Service, The University of Tennessee, Knoxville. 4 p.

### **Recommendations**

1. Plant small, slow-growing trees near sewer lines.
2. If faster-growing species are desired, plan to replace trees every eight to 10 years.
3. Even slow-growing trees will eventually interfere with sewer lines. These trees must be replaced periodically.
4. When building new sewer lines or improving existing lines, consider landscaping plans and potential root intrusion from trees.



### Recommended Trees for Planting near Sewer Lines

Botanical Name	Common Name	Comments
<i>Acer ginnala</i>	Amur Maple	Matures at 20-25 feet tall with a rounded to spreading shape. Usually a multi-stemmed tree with excellent tolerance to urban conditions. Fall foliage color can be yellow, purple and red.
<i>Acer griseum</i>	Paperbark Maple	Slow growing with heights to 25 feet. Cinnamon-brown exfoliating bark is attractive all year. Fall colors are orange, yellow and red.
<i>Acer palmatum</i>	Japanese Maple	Many selections are available with red or green foliage and various leaf forms. Needs good drainage and some protection from western sun. Slow growing.
<i>Amelanchier</i> spp.	Serviceberry	Flowers in spring prior to leafing out. Bark is smooth gray and is attractive in winter. Slow growing. <i>Amelanchier x grandiflora</i> 'Autumn Brilliance', 'Princess Diana' and 'Cole's Select' are good selections.
<i>Carpinus betulus</i>	European Hornbeam	'Pyramidalis' or 'Fastigiata' grows to 35 feet in height with a triangular canopy form. Foliage is dark green in summer and has yellowish cast in the fall. The bark is steel gray and is attractive during the winter.
<i>Cercis canadensis</i>	Eastern Redbud	Small, vase-shaped tree. Many cultivars exist with variations of flower color. Legume.
<i>Chionanthus</i> spp.	Fringetree	Grown mostly for the showy flower display in spring. Adapts readily to most sites from dry to somewhat moist.
<i>Cornus florida</i>	Flowering Dogwood	Tree can be quite particular to growing conditions. Blooms in early spring before leafing out. Showy flower bracts. Many cultivars are available.
<i>Cornus kousa</i>	Kousa Dogwood	Blooms after the leaves have unfurled in the spring. Attractive exfoliating bark. A group of hybrids called the Stellar series offer a selection of canopy forms and flowering characteristics. Red fall leaf color.
<i>Cotinus</i> spp.	Smoke Tree	Species include <i>C. coggygria</i> and <i>C. obovatus</i> . Small multi-trunk tree that grows 15-20 feet tall. Blooms in June-July with seed structure looking like a puff of smoke. Tolerant of drought. Several cultivars available.
<i>Crataegus viridis</i> 'Winter King'	Winter King Hawthorn	One of the best hawthorns. Vase-shaped canopy. White flowers in spring with showy red fruit in late summer and fall. Foliage turns scarlet to purple in fall. Avoid hawthorn species with thorns.
<i>Fagus sylvatica</i>	European Beech	'Dawyck Purple' and 'Fastigiata' are two excellent selections upright canopy form. Smooth, steel gray bark with shimmering green leaves during summer and a bronze color in the fall.
<i>Ginkgo biloba</i>	Ginkgo	'Fastigiata', 'Lakeview' and 'Princeton Sentry' are recommended for their upright, columnar forms. Tolerant of urban conditions, unique foliage and branch form, and bright yellow fall color. Free of pests.
<i>Gleditsia triacanthos</i> var. <i>inermis</i>	Thornless Honeylocust	Unique & delicate foliage tree with smooth bark when young and more scaly as it matures. Brilliant yellow leaf color in fall. Susceptible to many diseases and insects when older; replace trees after 10-12 years.
<i>Ilex x attenuata</i>	Foster Holly	Grows well in sun and shade. Branching habit is conical and dense. Foster #2 is a female that produces bright red berries. Foster #4 is a male holly. Slow-growing. <i>Ilex opaca</i> 'Croonenburg' is also recommended.
<i>Koelreuteria paniculata</i>	Golden Raintree	Heights to 30 feet. One of the few yellow-flowering trees. Flowers are showy in may and June. Tolerant to urban conditions.

<i>Lagerstroemia</i> spp.	Crapemyrtle	<i>L. fauriei</i> , <i>L. indica</i> and <i>L. fauriei x L. indica</i> are available with an array of flower colors (white, red, pink, lavender). Usually grown as a multi-stem shrub or tree with an upright appearance. Can be susceptible to winter injury.
<i>Magnolia grandiflora</i> 'Little Gem'	'Little Gem' Magnolia	'Little Gem' is a slow-growing evergreen magnolia that can withstand urban conditions of extreme heat and drought.
<i>Magnolia x soulangiana</i>	Saucer Magnolia	Many seedling selections bloom early and are often damaged by spring frosts. The Greshman hybrids, the Little Girl hybrids and the Lily Magnolia selections bloom later and often avoid frost damage.
<i>Malus</i> spp.	Crabapple	A small tree with showy flowers and fruits. Many flower, color and canopy forms available, but many are also susceptible to diseases. Fruits may be undesirable. Recommended varieties include Adirondack, Prairifire, Red Jewel, Sargent, Springsnow and White Cascade.
<i>Oxydendron arboreum</i>	Sourwood	Excellent small tree that flowers in the summer with bright red leaf color in the fall. Heights to 35 feet when mature, but slow growing.
<i>Prunus caroliniana</i>	Carolina Cherry Laurel	Small evergreen tree with a pyramidal to rounded canopy form. White flowers bloom in March-April. Likes full sun to partial shade and well-drained soils.



Photo Credit: Bret Ward

**Golden raintree is a recommended tree for urban landscapes near sewer lines.**



Photo Credit: Bret Ward

**Smoketree is a unique, diminutive tree with a small root system.**

SP628-15M-9/05 R12-4910-051-008-06 05-0063

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University of Tennessee Institute of Agriculture, U.S. Department of Agriculture and county governments cooperating.  
UT Extension provides equal opportunities in programs and employment.

**Printing for this publication was funded by the USDA Forest Service through a grant with the Tennessee Department of Agriculture, Division of Forestry. The Trees for Tennessee Landscapes series is sponsored by the Tennessee Urban Forestry Council.**

